

CLAIMS

1. An air conditioning system for vehicles comprising:
 - compressors different from each other;
 - displacement control system switching means for switching a displacement control system A to a variable displacement control system B with respect to said displacement control system A controlled by a displacement control value "a" among displacement control values "a" and "b" for said compressors different from each other and said variable displacement control system B controlled by said displacement control value "b"; and
 - feedforward displacement value calculation means for said variable displacement control system B for calculating a displacement control value of said variable displacement control system B as an input to a control object so as to obtain a target control displacement after the displacement control system is switched,

wherein, after the displacement control system is switched from said displacement control system A to said variable displacement control system B, said variable displacement control system B is started based on a feedforward displacement value calculated by said feedforward displacement value calculation means for said variable displacement control system B.
2. An air conditioning system for vehicles comprising:
 - a refrigeration cycle;
 - a compressor and a variable displacement compressor provided in said refrigeration cycle;
 - means for operating said variable displacement compressor;
 - compressor operation switching means for switching the compressor operation between said compressor and said variable displacement compressor; and
 - variable displacement compressor feedforward displacement value calculation means

for calculating a displacement control value of said variable displacement compressor as an input to said refrigeration cycle so as to obtain a target control displacement after the compressor operation is switched,

wherein, after the operation is switched from said compressor to said variable displacement compressor, said variable displacement compressor is started based on a calculated variable displacement compressor feedforward displacement value.

3. The air conditioning system for vehicles according to claim 2 further comprising:

refrigeration cycle load recognition means for estimating or detecting a physical value having a correlation with a thermal load applied to said refrigeration cycle,

wherein said variable displacement compressor feedforward displacement value is calculated referring to a refrigeration cycle load value recognized by said refrigeration cycle load recognition means before the operation is switched to said variable displacement compressor.

4. The air conditioning system for vehicles according to claim 3 further comprising:

an air duct;

a blower for sending air into a vehicle interior through said air duct;

a cooler connected to said refrigeration cycle for cooling said air sent to said vehicle interior;

cooler temperature recognition means for estimating or detecting a physical value having a correlation with a temperature of said cooler or a temperature of air passing through said cooler;

target cooler temperature calculation means for calculating a target cooler temperature referring to a refrigeration cycle load;

variable displacement compressor feedback displacement value calculation means

for calculating a feedback displacement value so as to control the displacement of said variable displacement compressor at a predetermined displacement referring to a deviation between said target cooler temperature and said value recognized as cooler temperature; and

time calculation means for calculating a time having a correlation with said refrigeration cycle load, until that said temperature of said cooler or said temperature of air passing through said cooler reaches a predetermined temperature,

Wherein, after the operation is switched from said compressor to said variable displacement compressor, said variable displacement compressor is started based on said feedforward displacement value calculated by said variable displacement compressor feedforward displacement value calculation means, and after said time calculated by said time calculation means passes, the operation of said variable displacement compressor is controlled based on said feedforward displacement value and said feedback displacement value calculated by said variable displacement compressor feedback displacement value calculation means.

5. The air conditioning system for vehicles according to claim 4, wherein said variable displacement compressor is started based on only said feedforward displacement value calculated by said variable displacement compressor feedforward displacement value calculation means without referring to said cooler temperature value recognized by said cooler temperature recognition means.

6. The air conditioning system for vehicles according to claim 2 further comprising:
an air duct;
a blower for sending air into a vehicle interior through said air duct;
a cooler connected to said refrigeration cycle for cooling said air sent to said vehicle

interior; and

at least one of cooler temperature recognition means for estimating or detecting a physical value having a correlation with a temperature of said cooler or a temperature of air passing through said cooler, outside air temperature recognition means for estimating or detecting a physical value having a correlation with a temperature of outside air, vehicle interior air temperature recognition means for estimating or detecting a physical value having a correlation with a temperature of vehicle interior air, cooler entrance air temperature recognition means for estimating or detecting a physical value having a correlation with a temperature of air at an entrance of said cooler, sunshine amount recognition means for estimating or detecting a physical value having a correlation with an amount of sunshine, blown air amount recognition means for estimating or detecting a physical value having a correlation with an amount of air blown by said blower, target cooler temperature calculation means for calculating a target value of said cooler temperature, and vehicle running speed recognition means for estimating or detecting a physical value having a correlation with a running speed of a vehicle,

Wherein a load of said refrigeration cycle is estimated or detected by referring to at least one of a cooler temperature recognized value, an outside air temperature recognized value, a vehicle interior air temperature recognized value, a cooler entrance air temperature recognized value, a sunshine amount recognized value, a blown air amount recognized value, a target cooler temperature, and a vehicle running speed recognized value.

7. The air conditioning system for vehicles according to any of claims 2 to 6, wherein a displacement varying compression mechanism of said variable displacement compressor comprises a displacement varying compression mechanism controlled by a displacement control signal or a displacement varying compression mechanism controlled by rotational speed control.